

# Description of *Labeo latebra* (Cyprinidae) from the Nile River in Sudan

by

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**Abstract.** – A new *Labeo* species was discovered during surveys conducted on the Nile basin in Sudan between 2006 and 2016. It is described herein as *Labeo latebra* sp. nov. It differs from all other *Labeo* species of the Nile basin by having only 12, rarely 13, scales around the caudal peduncle (instead of 16 or more), and from all *Labeo* species occurring in the Nile River except *L. meroensis* by having only 4.5, rarely 5.5, scales between lateral line and dorsal fin base (vs. 6.5–7.5 in *L. forskalii* and *L. coubie*, 6.5–8.5 in *L. horie*, and 8.5–9.5 in *L. niloticus*). It can be distinguished from *L. meroensis* by 34–37 scales in lateral line (vs. 39–41 in *L. meroensis*). Compared to other species of the genus in the Main Nile, the rostral flap is largely fused with the lip and has only a small free part. *Labeo latebra* sp. nov. is a rather compact and cylindrical *Labeo* species with a weakly swollen snout while all other Nilotic *Labeo* species have a clearly elongate appearance and a laterally compressed body.

**Résumé.** – Description de *Labeo latebra* (Cyprinidae) du bassin du Nil au Soudan.

Une nouvelle espèce de *Labeo* a été découverte au cours d’expéditions ichtyologiques organisées dans le bassin du Nil au Soudan entre 2006 et 2016. Elle est décrite sous le nom de *Labeo latebra* sp. nov. Elle diffère de toutes les autres espèces de *Labeo* du bassin du Nil par 12 écailles autour du pédoncule caudal, rarement 13 (contre 16 ou plus). Elle diffère également des autres espèces de *Labeo* du même bassin, hormis *L. meroensis*, par le nombre d’écailles entre la ligne latérale et la base de la nageoire dorsale qui est de 4.5, rarement 5.5 (vs. 6.5–7.5 chez *L. forskalii* et *L. coubie*, 6.5–8.5 chez *L. horie*, et 8.5–9.5 chez *L. niloticus*). Elle peut être différenciée de *L. meroensis* par le nombre d’écailles sur la ligne latérale 34–37 (vs. 39–41 chez *L. meroensis*). Le clapet rostral chez cette espèce est largement fusionné à la lèvre avec une légère partie qui est libre, comparée aux autres *Labeo* du Nil principal. *Labeo latebra* sp. nov. est une espèce plus trapue et plus cylindrique que les autres *Labeo* du Nil, avec un museau faiblement renflé où la partie libre du repli rostral est réduite.

With more than 3,000 described species (Nelson *et al.*, 2016), cyprinids are one of the most diverse fish families we know. In Africa, only in cichlids is the number of species higher (Lowe-McConnell, 1988), which is largely attributed to their impressive diversity in the African Great Lakes. Within cyprinids, the bottom dwelling subfamily Labeoninae is a major group containing approximately 450 recognised species occurring in Asia and Africa, 105 of which belong to the genus *Labeo* (Eschmeyer and Fong, 2016; Froese and Pauly, 2016).

Inside the Nile basin, six *Labeo* species are currently known (Boulenger, 1907; Moritz, 2007): *Labeo niloticus* (Forskål, 1775), *L. horie* Heckel, 1847, *L. coubie* Rüppell, 1832, and *L. forskalii* Rüppell, 1835 are widely distributed in the Nile system (Heckel, 1846–1849; Boulenger, 1907; Sandon, 1950; Abu Gideri, 1984; Bailey, 1994), while *L. meroensis* Moritz, 2007 seems to be restricted to the Sudanese Nile below Khartoum (Moritz, 2007; Neumann *et al.*, 2016). *Labeo victorianus* Boulenger, 1901, which is described from Lake Victoria and reaches Lake Kioga via

the Victoria Nile (see Reid, 1985), is the only species that occurs outside the Main Nile (Neumann *et al.*, 2016).

During the first field survey in the Sudan in 2006, which discovered *L. meroensis*, a single specimen of a second apparently new *Labeo* species was found among catches being sold at the central fish market in Khartoum. According to the information received from the fish traders, this specimen “likely originated from the Sudd area”. In 2008, four additional specimens were obtained from the same fish market allegedly originating from near Al-Qutaynah ( $N14.0^{\circ}$   $E32.4^{\circ}$ ) on the White Nile (Fig. 1). The real origin of these specimens remained doubtful until 2015, when a fresh specimen in a catch arriving directly from Jebel Aulia (Fig. 1,  $N15.24^{\circ}$   $E32.50^{\circ}$ ) on the Omdourman fish market was discovered. Until 2011, both fish markets receive catches transported on ice from Lake Nasser, Jebel Aulia (above and below the dam), the Sudd region and greater Khartoum (the Nile River above and below the confluence of the White and Blue Niles). Fishes are offered sorted according to species and size and the few individuals of the new *Labeo* were only found

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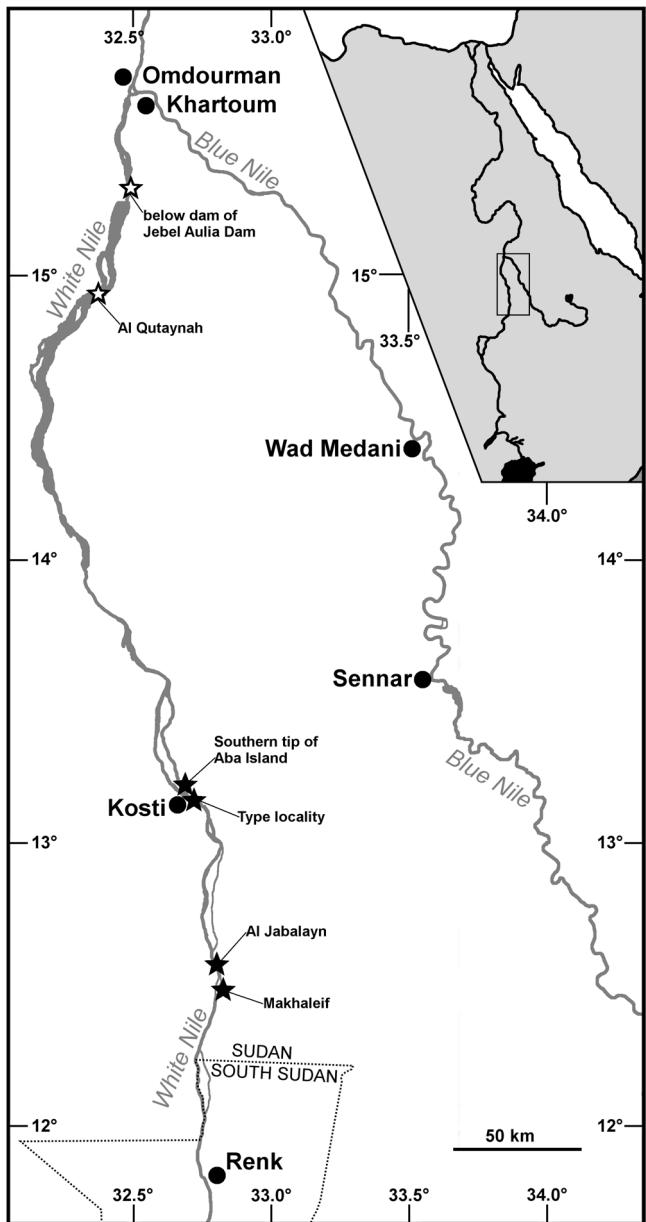


Figure 1. – Occurrence of *Labeo latebra* sp. nov. Filled stars: own records; open stars: records from fishermen via fish markets. Insert: outline of river Nile in Northeast Africa and position of detailed map (squared area).

in baskets containing fishes below 10 cm that arrived on the respective mornings. During our latest field campaign in the Sudan in April 2016, this new *Labeo* new species appeared quite frequently when searching the baskets with medium sized fish on the Omdourman fish market. Travelling up the White Nile to Kosti and Al Jabalayn (Fig. 1), living specimens formed part of our own catches, and thus ten years after the first observation, this new species is described based on a type series of 34 specimens and additional non-types.

## MATERIAL AND METHODS

Specimens were either purchased in the Khartoum and Omdourman fish markets in 2006, 2008, 2015 and 2016, or were collected using a small (2 × 1.2 m with 5 mm mesh size) and a medium sized (8 × 1.2 m with 6 mm mesh size) beach seine in 2016. The life colouration and colour pattern were documented in a small photo tank immediately after capture. Specimens were euthanised in an overdosed benzocaine bath. Fixation and preservation follows Neumann (2010).

Measurements and meristic counts of the new *Labeo* species are based on Reid (1985), Tshibwabwa and Teugels (1995) and Moritz (2007): all measurements were taken as point to point measurements to the nearest 0.1 mm. X-rays of specimens were obtained using an UltraFocus 100 (Faxitron Bioptics LLC, USA), at a maximum tube current of 0.3 mA and isowatt not exceeding 12W, which results in an electric tension ranging from 41–100 kV at a typical image acquisition time of 10 seconds. Specimens are deposited at the Zoologische Staatssammlung München (ZSM), the Deutsches Meeresmuseum in Stralsund (DMM), the Natural History Museum, London (BMNH), the Royal Museum for Central Africa (MRAC) in Tervuren, the Sudan Natural History Museum in Khartoum (SNHM), and the American Museum of Natural History, New York (AMNH). Tissue samples are stored at ZSM. Other abbreviations are: SL – standard length, TL – total length. Numbers in brackets indicate the amount of specimens.

## Comparative material

*Labeo ansorgii* Boulenger, 1907: BMNH 1907.6.29.210 (1), Dongoea Swamps, Cuene River, Angola. *L. brachypoma* Günther, 1868: BMNH 1866.3.8.13-15 (3), Lagos, Nigeria. *L. camerunensis* Trewavas, 1974: BMNH 1973.5.14.322-323 (2), Wowe River, Mungo system, Cameroon. *L. coubie* Rüppell, 1832: BMNH 1862.6.17.132-139 (7), Nile River, Khartoum, Sudan; BMNH 2005.4.18.112-113 (1), mouth of Alibori River, tributary of Niger River, Benin; BMNH 2006.4.17.28-29 (2), Comoé River, Côte d'Ivoire; DMM IE/9106 (1) Dissin, Mou Houn Basin, Burkina Faso; DMM IE/9214 (1), idem; DMM 9428 (3), Niger River at Malanville, Benin; ZSM 43211 (1), Lake Nubia, purchased at fish market in Khartoum. *L. dhonti* Boulenger, 1920: BMNH 1919.7.24.3-6 (3), Kalemie River, Democratic Republic of Congo. *L. djourae* Blache & Miton, 1960: BMNH 1960.6.7.169-170 (2), Aoué Ennedi, Chad. *L. forskali* Rüppell, 1835: ZSM 39863 (2), Nile River at Taraq Island, Sudan; ZSM 39870 (4), idem; ZSM 39874 (3), idem; ZSM 39857 (11), idem; ZSM 39858 (8) idem; ZSM 39869 (3) idem; ZSM 39872 (9), idem; ZSM 39873 (2); ZSM 39871 (16), idem; ZSM 35239 (4), Nile River at 6<sup>th</sup> Cataract, Sudan; ZSM 38843 (1), Blue Nile at Sennar at outlet canal of Sennar Dam; ZSM 35230 (11), idem; ZSM 35235 (11), idem; ZSM 35236 (8), idem; ZSM 35237 (14), idem; ZSM 35240 (7), idem;

ZSM 35568 (14), idem; ZSM 35586 (5), idem; ZSM 35586 (13), idem. *Labeo horie* Heckel, 1847: BMNH 1983.5.12.39-40 (2), Bussere River, South Sudan; ZSM 39860 (1), Nile River at Taraq Island below Hamdab High Dam, Sudan; ZSM 35287 (1), Nile River at 6<sup>th</sup> Cataract, Sudan; ZSM 35217 (1), Atbara River at Esh-Showak, Sudan; ZSM 35160 (1), White Nile at Kosti, Sudan; ZSM 35180 (1), idem; ZSM 43218 (1), White Nile at Jebel Aulia below dam, Sudan; DMM IE/6267 (1), fish market at Atbara, Sudan. *L. lineatus* Boulenger, 1898: BMNH 1975.6.20.508 (1), Lualaba River, Democratic Republic of Congo. *L. lukulae* Boulenger, 1902: BMNH 1934.8.31.77-89 (13), Wenchi, Ashanti Forest, Ghana; BMHN 1972.10.9.11-12 (2), Galma River, Nigeria. *Labeo meroensis* Moritz, 2007: BMNH 2006.11.9.1 (1), Nile River at Shendi, Sudan; BMNH 2006.11.9.2-8 (7), idem; BMNH 2006.11.9.9-10 (2, c&s), idem; DMM IE/6300 (1), idem; MRAC A6-46-P-1-3 (3), idem; BMNH 2006.11.9.11-13 (3), Nile River at Atbara, Sudan; ZSM 39862 (1), Nile River at Taraq Island below Hamdab High Dam, Sudan; ZSM 39864 (2), idem; ZSM 39865 (2), idem; ZSM 39866 (1), idem; ZSM 39867 (1), idem. *Labeo niloticus* Linnaeus, 1758: BMNH 1905.10.26.9 (1), Rosaries, Blue Nile, Sudan; DMM IE/6417 (1), White Nile between Khartoum and Jebel Aulia, Sudan; DMM IE/6408 (1), fish market in Khartoum; DMM IE/6409 (1), idem; ZSM 39856 (1), Nile River at Taraq Island below Hamdab High Dam, Sudan; ZSM 39859 (3), idem; ZSM 39855 (2), Nile River upstream Merowe Dam, Sudan; ZSM 35209 (1), Atbara River at Esh-Showak, Sudan; ZSM 35218 (1), idem; ZSM 35220 (6), Nile River at 6<sup>th</sup> Cataract, Sudan; ZSM 35221 (1), idem; ZSM 35288 (3), idem; ZSM 43614 (1), idem; ZSM 43219 (1), White Nile above Jebel Aulia, Sudan; ZSM 35161 (1), White Nile at Kosti, Sudan; ZSM 35178 (1), fish market in Esh-Showak. *L. parvus* Boulenger, 1902: BMNH 1975.6.20.512 (1), Lualaba River, Democratic Republic of Congo. *L. ogunensis* Boulenger, 1910: BMNH 1909.3.3.12-13 (2), Ogun River, Nigeria; BMNH 1981.2.17.63-66 (3), Red Volta, Ghana; BMNH 2005.7.26.15-16 (2), Pendjari River, Benin; BMNH 2006.4.18.21-22 (2), Niger River at Malanville, Benin; BMNH 2006.4.18.111 (1), idem; DMM IE/9410 (2), Sota River at Malanville, Benin. *L. senegalensis* Valenciennes, 1842: BMNH 2005.7.22.725 (1), Comoé River, Côte d'Ivoire; BMNH 2005.7.26.18 (1), Pendjari River, Benin; BMNH 2006.4.18.108-110 (3), Niger River at Malanville, Benin.

### *Labeo latebra*, new species (Figs 1-7, Tabs I-II)

#### Material

**Holotype.** – ZSM 44841, 126.4 mm SL, Sudan: White Nile at Kosti, retrieved from local fishermen deploying gill nets downstream of railway bridge (N13.15° E32.72°), coll. D. Neumann, T. Moritz, A.A. Saadelnour Abdalla, M.A. Abdallah, 15 Apr. 2016.

**Paratypes.** – DMM IE/6443 (1), 122.1 mm SL, Sudan: obtained at Central Souq el Samak [fish market] in Khartoum, likely traded from the Sudd-Region, coll. T. Moritz & V. von Vietinghoff, 26 Jan.

2006; DMM IE/11232 (1), 77.5 mm SL, Sudan: White Nile, in front of Fisheries Research Centre at Kosti (N13.17475° E32.67077°), coll. T. Moritz, M. Mertzen, 15 Apr. 2016; ZSM 39868 (3), 83.7-92.9 mm SL, Sudan: obtained in Central Souq el Samak [fish market] in Khartoum, allegedly traded from Al-Qutaynah (N14.0° E32.4°), White Nile, coll. T. Moritz, D. Neumann & N. Pöllath, 7 Apr. 2008; ZSM 43615 (1), 109.7 mm, same data as ZSM 39868; ZSM 44712 (1), 87.5 mm SL, Sudan: White Nile at Al Jabalayn boat landing site (N12.58312° E32.80355°), coll. D. Neumann, T. Moritz, M. Mertzen, A.A. Saadelnour Abdalla, M.A. Abdallah, 13 Apr. 2016; ZSM 44722 (1), 67.9 mm SL, Sudan: White Nile at Makhaleif village, 10 km south of Al Jabalayn (N12.51908° E32.82493°), coll. D. Neumann, T. Moritz, M. Mertzen, A.A. Saadelnour Abdalla, M.A. Abdallah, 17 Apr. 2016; ZSM 44742 (4), 75.6-107.9 mm SL, Sudan: White Nile at Kosti, floodplain at southernmost tip of Aba Island (N13.18849° E32.67175°), coll. D. Neumann, T. Moritz, M. Mertzen, A.A. Saadelnour Abdalla, M.A. Abdallah, 16 Apr. 2016; ZSM 44856 (4), 63.9-83.5 mm SL, same data as ZSM 44722; ZSM 44743 (8 now 4), 76.2-121.2 mm SL, Sudan: purchased at Omdourman Souq el Samak [fish market], allegedly traded from Jebel Aulia below dam (N15.24° E32.5°), coll. D. Neumann, C. Ratschan, A.A. Saadelnour Abdalla, 13 Apr. 2016; BMNH 2016.8.24.1-2 (2, ex. ZSM 44743), 81.0-104.2 mm SL; MRAC 2016.023.P.0001-0002 (2, ex. ZSM 44743), 82.8-112.2 mm SL; ZSM 44745 (1), 106.2 mm SL, Sudan: White Nile, sand bank between Kosti and Aba Island (N13.18864° E32.66605°), coll. D. Neumann, A.A. Saadelnour Abdalla, M.A. Abdallah, 19 Apr. 2016; ZSM 44840 (2), 107.8-108.0 mm SL, Sudan: purchased at Omdourman Souq el Samak [fish market], supposedly traded from the area of Al Jabalayn, coll. D. Neumann, C. Ratschan, A.A. Saadelnour Abdalla, 10. Apr. 2016; ZSM 44866 (6 now 4), 79.6-96.4 mm SL, Sudan: purchased in Omdourman Souq el Samak [fish market], likely traded from Al Jabalayn (N12.5° E32.8°), coll. D. Neumann, C. Ratschan, A.A. Saadelnour, 13 Apr. 2016; AMNH 266892 (2, ex. ZSM 44866), 77.9-88.7 mm SL.

**Other material.** – DMM IE/10702 (12), 68.9-110.4 mm SL, Sudan: purchased at Omdourman Souq el Samak [fish market], traded from the White Nile, exact locality unclear (likely Jebel Aulia), coll. T. Moritz, M. Mertzen, D. Neumann, 13 Apr. 2016; DMM IE/10728 (3), 84.0-91.1 mm SL, Sudan: purchased at Omdourman Souq el Samak [fish market], traded from Jebel Aulia, coll. T. Moritz, M. Mertzen, D. Neumann, 13 Apr. 2016; DMM IE/10743 (1), 52.7 mm SL, Sudan: White Nile floodplain at southernmost tip of Aba Island (N13.18849° E32.67175°), coll. D. Neumann, T. Moritz, M. Mertzen, A.A. Saadelnour Abdalla, M.A. Abdallah, 16 Apr. 2016; ZSM 44626 (1), 111.9 mm SL; Sudan: purchased at Omdourman Souq el Samak [fish market], likely traded from Jebel Aulia, coll. D. Neumann, Z.N. El Dayem Mahmoud, 03 Aug. 2015; SNHM (unregistered), several specimens, Sudan: White Nile floodplain at southernmost tip of Aba Island (N13.18849° E32.67175°), coll. D. Neumann, T. Moritz, M. Mertzen, A.A. Saadelnour Abdalla, M.A. Abdallah, 16 Apr. 2016.



Figure 2. – *Labeo latebra* sp. nov., holotype, ZSM 44841, 126.4 mm SL. Sudan: White Nile: Kosti.



Figure 3. – *Labeo latebra* sp. nov., holotype, ZSM 44841, 126.4 mm SL, directly after catch before fixation on 15 Apr 2016. Sudan: White Nile: Kosti.

### Diagnosis

*Labeo latebra* differs from all other *Labeo* species from the Nile in having only 12 (rarely 13) scales around the caudal peduncle (vs. 16 in *L. meroensis*, 16-18 in *L. forkalii* and *L. coubie*, 16-20 in *L. horie*, and 18-22 in *L. niloticus*). It further differs from all other *Labeo* in the Main Nile (sensu Neumann et al., 2016) except *L. meroensis* in having only 4.5 (rarely 5 or 5.5) scales between lateral line and mid-dorsal line (vs. 6.5-7.5 in *L. forkalii* and *L. coubie*, 6.5-8.5 in *L. horie*, and 8.5-9.5 in *L. niloticus*). From *L. meroensis* it differs in having 34-37 scales in lateral line (vs. 39-41 in *L. meroensis*).

*Labeo latebra* shares 12 caudal peduncle scales as diagnosed in Reid (1985) with the following African *Labeo* species: *L. parvus* Boulenger, 1902 and *L. lukulae* Boulenger, 1902 from the Congo basin, *L. chariensis* Pellegrin, 1904 and *L. djourae* Blache & Miton, 1960 from the Chad basin, *L. ogunensis* Boulenger, 1910 and *L. brachypoma* Günther, 1868 from Nilo-Sudanic river basins west of the Niger Delta, and the Upper Guinean endemite *L. obscurus* Pellegrin, 1908, which is confined to the Konkouré River. *Labeo latebra* sp. nov. differs from *L. ogunensis* by having 3.5 (rarely 4)

scales between lateral line and ventral fin insertion (vs. 4.5 in *L. ogunensis*). From *L. parvus*, *L. obscurus* and *L. brachypoma* in a higher lateral line scale count of 34-37 (vs. 30-33), and finally from *L. djourae*, *L. lukulae* and *L. chariensis* in the poorly developed snout which lacks a prominent sucker-mouth (vs. prominently swollen snout with well-developed sucker), the poorly developed ethmoid furrow (vs. very prominent ethmoid furrow) and the small nub-like tubercles on the snout (vs. usually prominent, acanthoid snout tubercles).

### Description

Based on holotype (Figs 2-3) and 33 paratypes. A small-sized *Labeo* species belonging to the cylindriform *L. forkalii* group sensu Reid (1985), which is characterised by its streamlined body, falciform dorsal fin and 9-10 branched dorsal fin rays. Maximum recorded size 126.4 mm SL (163.10 mm TL). Counts and proportional measurements are given in tables I and II. Body cylindriform and rather roundish with only slight lateral compression (Figs 2, 3, 7). Eyes medium-sized, in slight dorsolateral position, not visible if specimens are viewed ventrally. Tube of anterior nasal open-



Figure 4. – Variability in head shape of *Labeo latebra* sp. nov. **A:** DMM IE/11232, paratype, 77.5 mm SL, White Nile at Kosti, 15 Apr. 2016; **B:** ZSM 44745, paratype, 106.2 mm SL, White Nile at Aba Island, 19 Apr. 2016; **C:** ZSM 44712, paratype, 87.5 mm SL, White Nile at Al Jabalayn, 13 Apr. 2016.



Figure 5. – Mouth of *Labeo latebra* sp. nov. in ventral view, paratype ZSM 44712, 87.5 mm SL.

ing poorly developed, snout only feebly swollen, ethmoid furrow absent or only weakly developed (Fig. 4); tubercles if present small, restricted to dorsal snout and ethmoid furrow area, but absent from interorbital fields; rostral flap minute, closely adhering to upper lip except free distal lobes. Mouth without prominent sucker (Fig. 5), the two barbels proximal deeply embedded in lip fold but often with visible free distal tips, which reach beyond jaw articulation; inner upper labial fold with crenulated costae.

Dorsal fin concave with two simple and 10 branched rays; two additional small supranumerary simple spines in front of dorsal fin only visible in X-rays (Fig. 6); branched rays without filamentous extension. In smaller specimens dorsal fin slightly concave, changing to a more falciform contour in larger specimens. Pectoral fins inserted rather low on body flanks, their free ends reach to level of the dorsal fin origin but rarely beyond and terminate well in front of pelvic fin base. Pelvic fin insertion level with pectoral fins and situated

below the anterior half of dorsal fin; pelvics reach exactly to the anus. Anus and anal fin insertion separated by three to four scales, anal fin with two simple and five branched rays plus an additional single small supranumerary simple spine (Fig. 6). Caudal fin deeply notched, lobes pointed with 10 principal rays on upper and 9 (rarely 10) on lower lobe.

*Colouration.* – Living specimens with light grey to olive-brownish back with silvery reflections (Figs 3, 7B); lateral band faintly visible, including first scale row above and below lateral line; prominent dark blotch with bright green iridescence directly behind operculum at same level of eye and of roughly the same height or smaller. Body colouration below lateral line gradually brightening to light beige or white. Single scales with prominent bright orange centres loosely scattered on body flanks, visibly especially in dead fishes (Fig. 3). Posterior rim of scales intensely pigmented and dark except for belly-scales and scales near anal fin base; scales on the caudal peduncle with dark margin pronouncing the contour of each scale. Dorsal portion of the head yellowish-brown with greenish hue and similar green iridescence as on opercular series and cheek. Transverse dark stripe connecting tip of snout and eye which exceeds beyond the lower rim of eye (Fig. 7B, D). A second parallel dark band is occasionally visible connecting the nasal openings. On the lower head dark colours of the dorsal part gradually fade to light beige or white. Upper and caudal portions of iris prominent bright orange-red, ventrally blackish. All fins pale and translucent, grey markings near origin of dorsal fin rays, first pectoral and pelvic fin ray with whitish hue. Fins in fresh dead specimens clearly reddish to orange superimposed with a rather dark grey coloration; caudal fin lobes of individual specimens with faint dark margin on upper and lower lobe of caudal fin.

Preserved specimens dorsally brown, ventrally light beige. Lateral band faintly visible, less pronounced as in *L. parvus* or *L. ogunensis*. Fins pale whitish, but not trans-

Table I. – Morphometric characters of *Labeo latebra* type specimens, N = 34 (holotype + 33 paratypes).

Morphometric characters	Holotype	Range	Mean	SD
Standard length (SL) in mm	126.4	55.8-126.4	91.0	–
Total length in mm	163.1	72.9-158.7	116.8	–
in %SL				
Body depth	26.2	22.8-30.8	25.7	2.09
Head length (HL)	21.6	21.6-25.4	23.6	0.92
Predorsal length	45.2	41.4-48.7	45.5	1.38
Pre-anal length	80.4	75.1-85.7	79.9	2.14
Prepectoral length	22.9	21.6-25.4	23.6	1.23
Prepelvic length	53.9	47.4-56.8	52.7	1.80
Dorsal fin base	22.8	19.4-23.5	21.4	1.16
Anal fin base	8.4	6.1-10.8	8.4	1.07
Pectoral fin base	4.9	4.2-6.7	5.3	0.61
Pelvic fin base	4.8	3.4-6.6	5.0	0.70
Dorsal fin height	26.8	23.1-31.3	28.2	1.98
Anal fin height	17.6	17.3-22.0	19.5	1.21
Pectoral fin length	20.6	18.3-25.0	21.7	1.72
Pelvic fin length	18.1	17.0-22.0	19.7	1.22
Caudal peduncle length	11.5	11.5-16.9	13.4	1.19
Caudal peduncle depth	14.0	12.0-15.2	13.3	0.69
in %HL				
Snout length	45.8	37.2-46.1	41.8	2.50
Interorbital width	45.6	38.2-49.0	41.2	2.28
Eye diameter	19.9	18.3-24.9	21.6	1.90
Post-orbital length	40.2	33.7-41.9	38.4	1.79
Mouth width	31.6	23.2-39.8	29.7	4.17

Table II. – Meristic characters of all *Labeo latebra* type specimens (holotype + 33 paratypes; X-rays of 26 specimens). Numbers in brackets indicate number of specimens sharing this character.

Meristic characters	Holotype	All type specimens
Procurent dorsal fin rays	2	2 (26)
Simple dorsal fin rays	2	2 (34)
Branched dorsal fin rays	10	10 (34)
Procurent anal fin rays	1	1 (26)
Simple anal fin rays	2	2 (34)
Branched anal fin rays	5	5 (34)
Upper procurent caudal fin rays	9	8 (3); 9 (14); 10 (9)
Upper principal caudal fin rays	10	10 (26)
Lower principal caudal fin rays	9	9 (22); 10 (4)
Lower procurent caudal fin rays	7	7 (6); 8 (16); 9 (4)
Scales in lateral line	34	34 (10); 35 (10); 36 (10); 37 (4)
Scale rows between lateral line and dorsal fin	5.5	4.5 (27); 5 (4); 5.5 (3)
Scale rows between lateral line and pelvic fin	3.5	3.5 (31); 4 (3)
Scales around caudal peduncle	13	12 (32); 13 (2)
Total vertebrae	34	34 (14); 35 (18); 36 (2)
Insertion of dorsal fin at vertebra number	8	8 (26)
Insertion of anal fin at vertebra number	15	15 (8); 16 (14); 17 (4)

lucent, with weak pigmentation between rays of unpaired fins; caudal fin lobes with dark margin, more pronounced on lower lobe. Strong artificial orange-brown staining especially on the skull (*e.g.* cleithrum, preoperculum) in preserved species, including soft tissues in single specimens as a result of fat staining during initial fixation.

### Distribution

Known so far from the White Nile in the Republic of the Sudan, from Jebel Aulia to close to the border of the Republic South Sudan in the vicinity of Makhaleif (Fig. 1). Early findings in the Khartoum and Omdourman in 2006 and 2008 fish markets, which arrived with Dinka fish traders from the area of Malakal (N9°31' E31°39'), suggest that the distribution extends further south into the Sudd area.

### Biology

Currently unknown; long intestines partly filled with small particles (Fig. 6) suggest that this species is browsing the upper sediment layers on the riverbed for Aufwuchs and organic material. Recovered during surveys in Kosti and Al Jabalayn on soft-bottomed in-shore habitats, in quite shallow water.

### Etymology

Named after the Latin word ‘*latebra*’ meaning ‘delitescence’ or ‘seclusion’ due to the fact that the species remained unrecognised for such a long time, and because confirming the locality information and occurrence was a challenge for more than 10 years. A noun in apposition.

## DISCUSSION

The genus *Labeo* is widely distributed in Africa and Asia with more than 100 valid species (Froese and Pauly, 2016) and new species are still described regularly from Africa (Tshibwabwa, 1997; Tshibwabwa *et al.*, 2006). Besides the new *Labeo* species in the Main Nile (Moritz, 2007; this paper), the Sudanese affluents of the Bahr El Arab and the tributaries to Chad basin in the West and South Dafur remain unexplored but seem to harbour one additional *Labeo* species (DN, pers. obs.). Ichthyological fieldwork is difficult because of the unstable political situation in this area, especially close to the new border with, and in, the Republic of South Sudan. This is reflected in the history

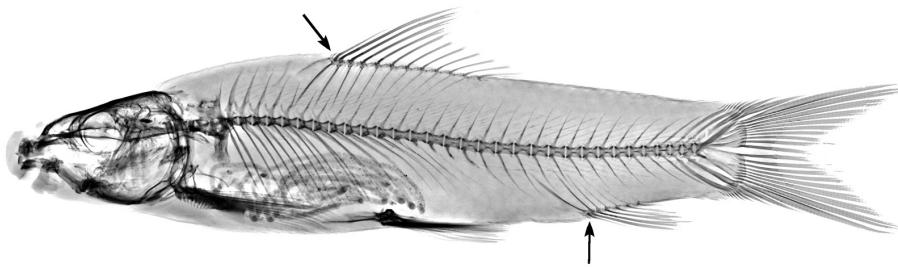


Figure 6. – X-ray of *Labeo latebra* sp. nov., ZSM 44712, paratype, 87.5 mm SL. The arrows point to two minute small spines at origin of dorsal fin and one such spine at origin of anal fin.

of the description of *L. latebra*, which we first observed in catches traded by Dinka people in the Central Souq el Samak in Khartoum in 2006 and 2008. After the secession of the South Sudan, this species disappeared from the fish markets in Khartoum and Omdourman, while it was impossible to reach the area of Malakal for our own surveys. Due to a presumptive decrease in mesh size in the Republic of the Sudan to satisfy the increasing demand for fish, which seems plausible from a subjective increase of traded fishes below 15 cm in total length, this species appeared regularly in the Omdourman fish market during the flood season in August 2015 and the end of the dry season in April 2016. From our own observations in Kosti and Al Jabalayn and in fish markets in Khartoum and Omdourman, it seems that *Labeo latebra* is not rare in the White Nile, but the exact range of this species in the Main Nile basin and how far it reaches into the South Sudan and Sudd region remains unclear. The habitat conditions in the White Nile in the area of the Jebel Aulia dam, in Kosti and Al Jabalayn are rather lentic, which suggests that this small *Labeo* species either prefers or is capable of coping with stagnant water conditions or weak to moderate water velocity. Comparison of populations along the White Nile in the Republic of the Sudan reveals variability, especially in snout shape, size and shape of the rostral flap and in the extension and size of the tubercles on snout and the ethmoid furrow (Fig. 4). This variation seems to correspond with observed habitat conditions: specimens with a prominent ethmoid furrow and tubercles on the head were observed in Al Jabalayn and Makhaleif, where the White Nile flow is modest but still perceptible. Below the rocky outcrops in Al Jabalayn (literally: “the two rocks”) the White Nile ceases to flow and enters a huge but rather shallow floodplain, which grows until Jebel Aulia (Rzóska, 1976). Upstream of Al Jabalayn, the ground is sandy to muddy with interspersed rocky escarpments or huge granite boulders, while around Kosti and downstream stagnant water conditions and soft-bottom habitats prevail. Thus the observed variability of *Labeo latebra* may be related to differences in water velocity, with specimens in higher water currents tending to have flatter heads with a more pronounced ethmoid furrow and more prominent and increased numerous tubercles. Reid (1985) supposed that the tubercles in particular are an “ecophenotypic” feature for African *Labeo* (p. 44)

and that their “production of a particular form depends on the age, size and habitat of the fish”, respectively (p. 45). Currently, however, we cannot exclude that the expression of tubercles in *L. latebra* could be linked to different stages of maturity, sexes or seasonal adaptations due to changing flow regimes in the course of the year. A similar variability in head shape and extension of tubercles can be observed in *Labeo forskalii* specimens from Sennar on the Blue Nile and specimens from Taraq Island near Karima on the Nile below the Hamdab Dam. To make firm statements on the cause of the observed variability, *i.e.* sex differences, seasonal variations or a combination of both (*e.g.* with beginning of mating season with induced differences in the flow regime) more material needs to be collected during different seasons of the year. Independent of this, the occurrence of *Labeo latebra* in rather warm water on shallow river banks seems to indicate that this species tolerates higher water temperatures and lower oxygen concentrations compared to its congeners in the Nile.

*Labeo latebra* belongs to the small sized-sized *Labeo* species. Even though this species seems to be common, it has been overlooked so far and the diversity of the fish fauna in the Main Nile seems to be higher than previously assumed (Neumann *et al.*, 2016). This is not surprising because the number of investigations into the fish diversity in the Nile are rather limited and largely date back to the first half of the last century with a few exception (*e.g.* Rüppell, 1829, 1832, 1835; Boulenger, 1907; Sandon, 1950; Abu Gideri, 1984; Bailey, 1994). After Boulenger (1907) comprehensive summary on the Nile fish fauna, only three new species were described by Johnson (1926) and Abu Gideri (1967) from the Main Nile (*sensu* Neumann *et al.*, 2016). Observations and studies on Nile fishes are still scattered and restricted to specific accessible points, while the biology of most species remains more or less unknown. To understand the fish diversity in the Main Nile in the 21<sup>st</sup> century, more comprehensive investigations, which include all the relevant active sub-basins and watersheds in the Main Nile Basin, are needed.

#### Key to *Labeo* species of the Nile basin

- 1a. 16 or more circumpeduncular scales ..... 2
- 1b. 12 (rarely 13) circumpeduncular scales . . . *Labeo latebra*

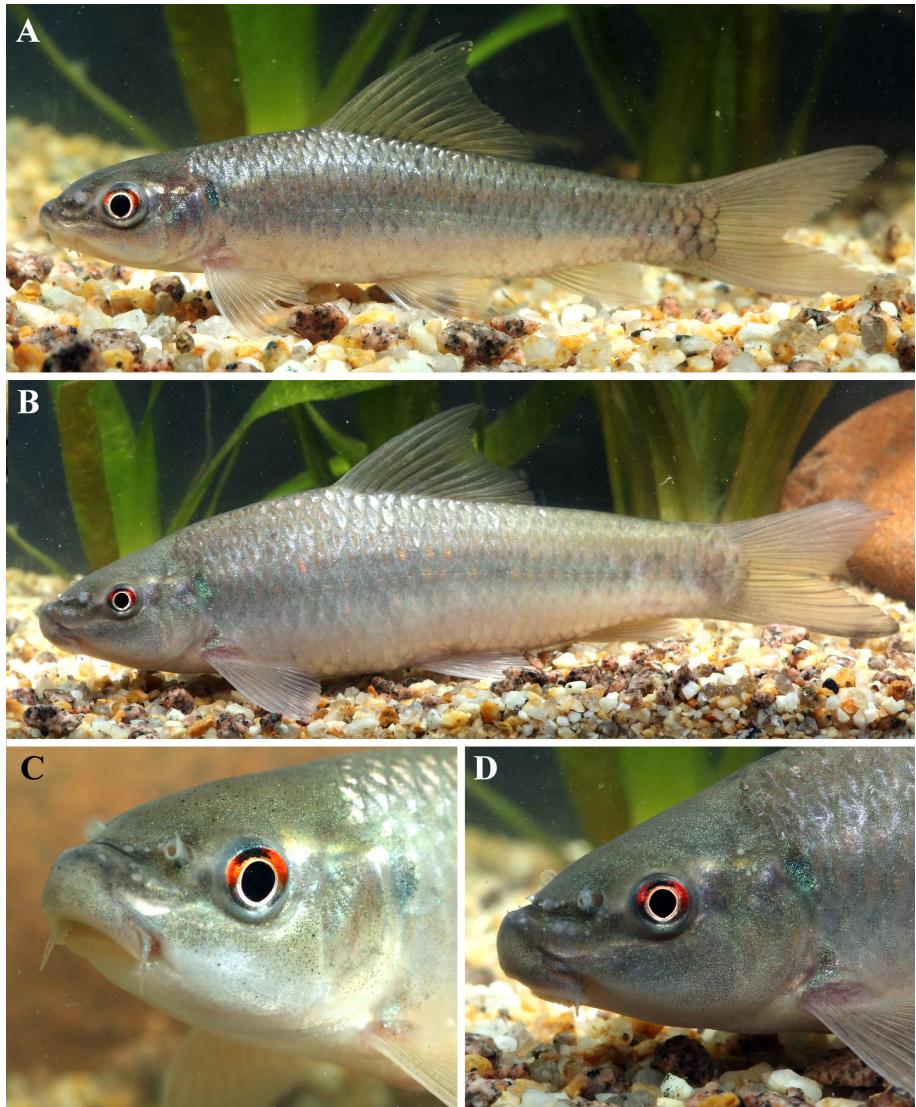


Figure 7. - Live specimens of *Labeo latebra* sp. nov. A, C: Juvenile specimen, 52.7 mm SL, DMM IE/10743; B, D: Larger specimen, 95.0 mm SL, SNHM unregistered. Both from Aba Island close to Kosti, coll. 16 Apr. 2016.

- 2a. Rostral flap absent; upper labial fold without papillae on lips; inner surface of lips without transversal ridges ..... 3
- 2b. Rostral flap present; upper labial fold with papillae on lips; inner surface of lips with transversal ridges ..... 4
- 3a. 5.5-6.5 scale rows between lateral line and ventral fin; 14-16 branched dorsal fin rays ..... *Labeo niloticus*
- 3b. 4.5 scale rows between lateral line and ventral fin; 12-14 branched dorsal fin rays ..... *Labeo horie*
- 4a. Upper margin of dorsal fin straight or slightly convex; body high and laterally compressed; 11 or more rays in dorsal fin ..... *Labeo coubie*
- 4b. Upper margin of dorsal fin concave; body cylindriform streamlined; 11 or less branched rays in dorsal fin ..... 5
- 5a. 35-36 scales in lateral line; endemic to Lake Victoria and affluents ..... *Labeo victorianus*

- 5b. 37-41 (very rarely 36) scales in lateral line; not occurring in Lake Victoria ..... 6
- 6a. Belly scaled posterior of level of pectoral fins bases; usually 6.5 to 7.5 scales between lateral line and mid-dorsal line ..... *Labeo forskalii*
- 6b. Scaleless area of chest V-shaped and extended much behind bases of pectoral fins; usually 5.5 (rarely 6.5) scales between lateral line and mid-dorsal line ..... *Labeo meroensis*

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